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An Experiential-Learning Lesson to Encourage Teamwork and Healthy Practices †

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Many careers require individuals to work together as a team. However, group work or teamwork is often met with resistance in an academic setting, and students can struggle to learn the skills associated with collaboration. I present a lesson that has the overarching goal of helping students practice and learn to make healthy lifestyle choices in the context of experiential learning. Additional learning objectives are to help students understand the physiological processes related to heart disease, practice effective prevention of this medical ailment, and encourage teamwork. Students received a risk score calculated from a randomized combination of hypothetical lifestyle characteristics that affect heart disease risk. Students then spent time outside of class gaining points against their assigned risk score by engaging in specific healthy lifestyle choices outlined on their score sheet. In unannounced pretests and posttests, students showed significant learning gains related to the physiological mechanisms and preventative agents of heart disease. Practicing proper diet, physical activity, and teamwork during adolescence and early adulthood contributes to the integration of these essential healthy habits throughout adulthood. Many students reported that collaboration among the group was a key component in overcoming the challenges associated with completing heart disease prevention actions on their score sheets. The lesson promotes creativity and the building of a support network to lower their risk scores, and it provides them with the opportunity to synthesize information and evaluate their performance in the activity.

INTRODUCTION

Several species of social animals rely on teamwork and cooperation to achieve tasks with greater efficiency (e.g., 1–4). Humans can benefit from working together as a team by experiencing synergistic gains (5) as well as team members gaining a sense of community, meaningfulness, and perceived job satisfaction (6, 7). Many employers place a high value on the ability to work together in a team because teamwork often results in increased job performance (8, 9), which can include conducting more impactful research (10). The value of teamwork in science has increased in recent decades, and larger teams have resulted in greater scientific output and influence (11). Thus, the ability to work in a team is a critical skill that students should practice throughout their training. However, teaching students teamwork and helping them see its value can often prove difficult in an academic setting (12, 13).

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While many students might have little desire to collaborate and may undervalue teamwork, experiential learning, which requires students to focus on completing a challenge rather than emphasizing group work, might side step the resistance to cooperative learning. Connecting with others can evolve naturally from a shared struggle (14), which can be simulated in an academic setting. Experiential learning incorporates several facets of active learning including the cognitive components of reflecting and thinking as well as the behavioral components of observing and acting (15). Reflection enables students to synthesize the information they gained by coupling physical and mental processes (16). Through experiential learning, students engage in an activity to learn and apply concepts in a realistic and relevant environment. The lesson presented here employs the technique of experiential learning to encourage teamwork skills through a shared struggle.

Another useful application of experiential learning is practicing healthy lifestyle choices and reflecting upon the process of actively engaging in these habits; the lesson described here employs the aforementioned experiential learning technique for this purpose also. A healthy lifestyle typically includes a nutrient-rich diet, regular physical exercise, and avoidance of smoking and excessive alcohol consumption. However, most college students do not exercise regularly and have diets that lack the recommended

intake of servings of fruits and vegetables (17–20). Several factors, such as a lack of a safe environment for physical activity, easy access to unhealthy foods, increased options for sedentary leisure activities, and perceived lack of time and motivation have led to challenges in adapting healthy lifestyles for children, adolescents, and young adults (19, 21, 22). Developing an unhealthy lifestyle during adolescence can correlate with health complications in adulthood regardless of adult lifestyle choices (23). Additionally, many poor nutritional and exercise habits developed during college years can extend throughout adulthood (18). Thus, teaching adolescent and young adult students the importance of healthy lifestyle habits might become paramount in ensuring the longevity and quality of life of future generations. Given that several obstacles prevent students from engaging in healthy lifestyles, I propose that students can easily break down these barriers by working together to overcome their shared struggle.

Intended audience

This activity is appropriate for a wide range of students but is ideal for a relatively small class size (up to 40 students) to facilitate a class discussion. This activity can easily integrate into an introductory biology, physiology, public health, or allied health course curriculum either for majors or nonmajors. The lesson would fit best in a broader disease or cardiac physiology unit. The lesson could also be used during a multi-day K–12 outreach program.

Learning time

This activity requires two class periods of 50 minutes each. The bulk of this activity occurs outside of class time, when students have several opportunities to engage in healthy lifestyle activities. One should allot about 40 minutes for this activity in the first class period, which includes time to explain the activity. An additional five to ten minutes should be designated for a pretest if desired. In the second class period, the major focus of the lesson is a class discussion for students to share the major concepts they learned from the activity, the easiest and most difficult components of the activity, their favorite and least favorite components of the activity, if and how teamwork played a role in completing the prevention activities, and any surprising outcomes associated with completing the activity. While class discussion times often vary based on the student population and instructor, one should expect to spend about 20 to 25 minutes discussing the activity. Students should complete the reflection questions before the class discussion, at the beginning of the second class period; the reflection questions should take students about 10 to 15 minutes to complete. An additional five minutes can be used to add up final scores and evaluate the score sheets, and another five to ten minutes are necessary if administering a posttest.

Prerequisite student knowledge

Students do not need any specific prior knowledge but should have completed a high school biology course to maximize the learning gains from this lesson.

Learning objectives

The lesson focuses on the core competency and disciplinary practice of communicating biological concepts and collaborating in a diverse scientific community through team participation as described by *Vision and Change in Biology Undergraduate Education* (24). Upon completion of the heart disease experiential learning activity, students will

1. have demonstrated teamwork by working with others to overcome challenges;
2. be able to define and describe heart disease physiology;
3. be able to list several lifestyle choices to help prevent heart disease and describe how to incorporate them into their lives; and
4. have gained practice communicating in a classroom setting.

PROCEDURE

This activity can be used as a supplement to a lecture lesson plan or recitation session activity as most of the activity is completed outside of class time.

Materials

To complete this activity, each student needs a score sheet (Appendix 1). Note: Points on the score sheets might need to be adjusted to reflect the actual amount of time between the first and second class periods. The current score sheet is written for two days between class periods. To set up part of the score sheet, dice are needed—either one per student or one per pair of students. The rest of the score sheet can be set up using the presentation (Appendix 2).

Student instructions

Appendix 3 provides complete instructions for students. Students first create a character to role-play throughout the heart disease activity. Students will then be guided through a process to select a health status for each risk factor on the score sheet to record in the Risk Score column (Appendix 1). Students will spend the time between this class period and a future class period completing prevention activities outlined on the score sheet to earn prevention score points to record in the Prevention Score column. After completing each prevention activity, a student must have a witness verify by initialing the score sheet in the appropriate box. In the second class period,

students can calculate the difference between their Risk Score and Prevention Score to evaluate the relative risk of developing heart disease for their characters. Students can also use this time to reflect on their own health habits.

Faculty instructions

In the first class period, students gain background information on heart disease, which can be presented to students in a mini interactive lecture that spans about 10 to 15 minutes. This background information should include the general physiology, causes, and symptoms associated with heart disease (Appendix 4). To simulate variation in general health and predisposition to heart disease without calling attention to the actual variation present among the students in the class, the students will create their initial health status based on random draws, will assign this health status to a character they create on their score sheet (Appendix 1), and will set up their score sheets as a class. The score sheets are set up by rolling dice for the first few risk factors and asking students to pick an item from a list for the remaining risk factors (Appendix 2). The number on the die or item from the list is revealed as associated with a specific initial score for the students to write down on their score sheet for each risk factor. The students have until the next class period to complete as many of the prevention activities on the score sheet as possible, and I offered a group hike over the weekend as an opportunity to gain bonus points. For the second class period, students work individually or with a partner to evaluate their score sheets and add up their scores, complete the reflection questions, and participate in an instructor-led class discussion.

Suggestions for determining student learning

Formative assessments can be made during the second class period. I relied mostly on qualitative feedback during class discussions to evaluate the effectiveness of this activity in promoting teamwork and in cultivating confidence in verbal communication of scientific terms and processes as well as reflecting on experiences. Pretests and posttests and reflection questions (see Appendix 3) can serve as summative assessments. I used identical pretests and posttests for quantitative feedback to evaluate the learning gains regarding heart disease prevention from this activity. These assessments asked the students to 1) define and describe heart disease and 2) explain how to prevent heart disease; assessments were scored with each question worth one point. To receive a full point for the first question, students needed to explain that the buildup of fats in the blood vessels can constrict or prevent blood flow and can lead to a heart attack; half a point was awarded to students who included one or two of these components but not all three. To receive a full point for the second question, students needed to list at least three specific methods for decreasing the risk of heart disease; half a point was awarded to those who listed one or two methods or gave vague answers such as "a healthy lifestyle" rather than explicitly listing factors that contribute to a healthy lifestyle. Pretests and posttests were unannounced, and students completed them without any aid. Through both reflection questions and class discussions, students can evaluate their experiences to gain broader understandings of the importance of working together towards a common goal. This activity, with its inherent physical and mental challenges, seems to naturally foster teamwork.

Sample data

Data were collected from two iterations of the lesson. The first iteration was implemented in a very small class with only six students completing the lesson. However, 42 students completed the lesson in the second iteration. Each student was able to complete the majority of the challenges; however, no students attained all possible Prevention Score points listed on the score sheets. Students responded positively to this lesson and demonstrated evidence of teamwork as well as learning the causes, physiological mechanisms, and prevention methods of heart disease. Comments from students are summarized in Table 1.

Safety issues

None.

DISCUSSION

Field testing

This lesson was initially implemented in a general biology class during a six-week summer program for prospective college students who were currently entering their junior or senior year of high school. The biology class was taught at the undergraduate introductory course level. The program occurred on the college campus of a midsized university in the Rocky Mountain region of the United States of America. This activity occurred in the last week of the summer program during our physiology unit. Seven students participated in the activity, but one student could not attend the second class and, thus, did not complete the posttest. A second iteration of the lesson occurred in an introductory biology course for those majoring in biology or a similar field (e.g., exercise science or environmental science) with students ranging from freshmen to seniors. This course was held at the same institution as the aforementioned six-week summer program.

Evidence of student learning

The students met all four learning objectives with quantitative evidence to support their achievements of the second and third learning objectives. During the class discussion

TABLE 1.
Sample reflections from students.

"Eating more fruit was the easiest"
"Eating carrots was super easy"
"The activities kind of gave me a better understanding"
"I didn't really have to change my lifestyle much"
"Helping others so they can understand"
"Staying off of our cell phones was the most difficult"
"Working with one another"
"It was easier to eat healthier when a friend was there to do it with me, and we were able to encourage each other"
"I used my friend to hold me accountable to making the alternate choices"
"It made it a lot easier to complete the activities with a partner doing them as well"
"I wanted to challenge myself"
"It is easier to work with a small focused group so you can hit the community values"
"People may have an easier time exercising if they do it in a group"
"Getting people together to work for a common goal of health will not only improve participation but longevity of the program"
"It is easier/more fun for people to do things with other people. It adds a level of support that encourages people to stick with their goals"
"It's easier to complete something when you have people around you to keep you accountable"
"It's easier to do when you have a support group"
"It's easy to sit on the couch alone, but when you join a group class, having people around with positive attitudes help with motivation! (Signed up for a group class with 4 coworkers)"
"There is power in numbers, and people would feel more comfortable working out in groups with people they know"
"It's nice to have a support group and people who can relate with what [you're] doing"
"If a person is part of a group all working for the same goal and holding each other accountable, they are more likely to make changes and progress"

Student comments about completing the healthy lifestyle heart disease prevention activity, made immediately following the class discussion during the second class period for the activity.

as well as on the post assessment, students demonstrated a strong understanding of how heart disease physiologically affects the body, as well as preventative measures for heart disease, by listing several symptoms, describing the process of restricted blood flow and how that can lead to other physiological problems, and providing specific examples of preventative measures using the activities they completed over the previous two days as examples. Although limited by a small sample size, the field testing suggests that students made significant learning gains. The students performed significantly better on the posttest than on the pretest in both the initial field test (Wilcoxon signed rank test with continuity correction, $p = 0.035$, $V = 21$, $n = 6$; Fig. 1A) and in the second field test (Wilcoxon signed rank test with continuity correction, $p < 0.001$, $V = 519$, $n = 42$; Fig. 1B). In general, students agreed that the easiest changes to make were the dietary changes, and they struggled the most with giving up cell phone time (cell phone usage was used to simulate smoking). The students reported that, overall, the activity was informative; the healthy lifestyle tasks were reasonably easy to complete; and the activity was fun.

Qualitative data provided evidence that the students achieved the first and fourth learning objectives. In the first iteration of the lesson, all six students worked together to complete the challenges. These students worked together to earn points for the physical activity prevention activity by organizing a game of hide and seek in which they jogged to find each other for extra exercise. In the second iteration, 63% of the students reported that they worked with others to complete the activity, and several students who completed the activity alone mentioned an interest in working with another student in the future to try to continue these healthy lifestyle practices (e.g., "I need to find a buddy," "I think getting a partner would be nice when I start working out at the gym regularly"). Two general patterns emerged in the responses of students who worked independently: 1) students wanted to challenge themselves by completing the activities alone without the aid/camaraderie of others, or 2) students wanted to complete activities with others but were unsuccessful in organizing times to work with a partner during the specific week the activity was assigned. Additionally, 82% of students specifically mentioned positive effects of teamwork in Question 6 of the student handout (Appendix 3). The data suggest that the teamwork component of the lesson might be more easily achieved in a small-group setting; however, the strong teamwork component observed from the first iteration of the lesson could also be an artifact of the particular population of students rather than the class size. The lesson might also increase participation; one student from the first iteration of the lesson verbally contributed to a class discussion for the first time all summer during this lesson. It is possible that she felt more comfortable answering questions about heart disease and its prevention because she could speak about her experiences from the activity. It is also possible that she gained confidence through the support of the other students in their team approach to the activity, as teamwork can result in confidence gains leading to increased contribution (26). However, this increase in confidence might have occurred independently of completing the activity.

Through this lesson, the students became more aware of the effects of and preventative measures for heart disease

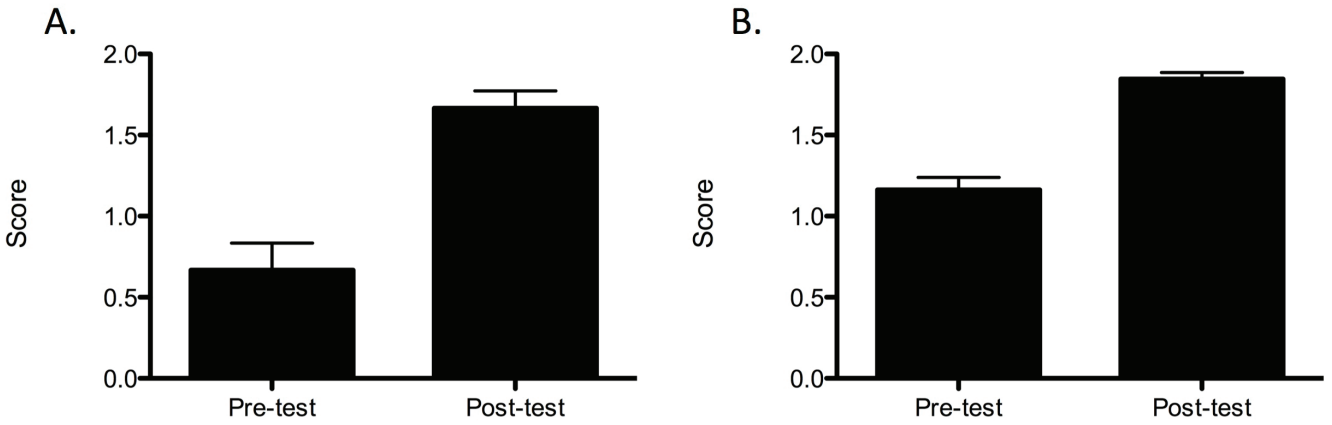

FIGURE 1. Student performance on pretest and posttest. The learning gains from this activity were measured using a pretest and posttest in the initial (A, n = 6) and second iteration (B, n = 42) of the lesson, and data were analyzed using a Wilcoxon signed rank test with continuity correction in R version 3.4 (25). Students completed identical pre- and posttests addressing their understanding of how heart disease affects the body and preventative actions. The pretests and posttests consisted of two questions that were each worth one point: 1) Define and describe heart disease, 2) Explain how to prevent heart disease. These assessments were scored with students receiving a full point for including the concept that heart disease refers to a set of conditions in which the heart becomes overworked as a result of the buildup of fats in the blood vessels leading to prevention of blood flow and potentially causing a heart attack, and a full point for including at least three specific methods related to decreasing the risk of heart disease.

as well as discovering that not only are they capable of making healthy lifestyle choices, but these small lifestyle changes can be easy to complete, especially with the support of classmates. Rather than forcing students to work together in groups, which is often met with resistance, this activity naturally encourages teamwork. By completing this activity, most students also demonstrated an ability to implement teamwork with minimal guidance and reap its rewards of synergy in an academic setting. Through class discussion, students demonstrated their ability to synthesize information from the activity to develop lifestyle plans for preventing heart disease. Finally, through the experiential learning approach, the students learned valuable life skills through their own self-directed learning.

Possible modifications

This lesson can be modified to 1) incorporate a formal written assignment, 2) work in a larger class setting, and/or 3) focus more directly on improving student comprehension of physiological mechanisms. When I implemented the lesson, students began to compose lifestyle plans through class discussion. As a possible extension to this activity, students could construct written personalized lifestyle plans for reducing the risk of heart disease for themselves and/or loved ones as either an in-class or homework assignment. Given the teamwork focus of this lesson, it might be useful in larger classes to separate students into smaller groups, which would likely enable students to better encourage each other and keep each other accountable. To focus more specifically on physiology, this lesson can also be modified such that the students use diagnostic symptoms to generate their own prevention activities on the score sheet rather than having issues and prevention activities provided to them. For example, instead of including a risk factor, such as "Too much salt? *Exchange a salty food for a healthier option at any meal,*" the score sheet can present students with the diagnostic symptom of "concentrated urine, increased blood volume." The students would then write and take a preventative action to decrease salt intake, such as "ate a low-sodium snack."

SUPPLEMENTAL MATERIALS

Appendix 1. Student score sheet
Appendix 2. Presentation to set up score sheets
Appendix 3. Student handout and reflection questions instructor key
Appendix 4. Mini interactive lecture outline

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